

AUS9-1999-0269-US1

ABSTRACT OF THE DISCLOSURE

BATTERYLESS, OSCILLATORLESS, ANALOG TIME CELL USABLE AS AN
HOROLOGICAL DEVICE WITH ASSOCIATED PROGRAMMING METHODS AND
DEVICES

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A simple electronic horological device, termed a time cell, is presented with associated methods, systems, and computer program products. A time cell has an insulated, charge storage element that receives an electrostatic charge through its insulating medium, i.e. it is programmed. Over time, the charge storage element then loses the charge through its insulating medium. Given the reduction of the electric potential of the programmed charge storage element at a substantially known discharge rate, and by observing the potential of the programmed charge storage element at a given point in time, an elapsed time period can be determined. Thus, the time cell measures an elapsed time period without a continuous power source. One type of time cell is an analog time cell that may have a form similar to a non-volatile memory cell, particularly a floating gate field effect transistor (FGFET). The time cell may have an expanded floating gate for storing an electrostatic charge. At a given point in time after programming the analog time cell, a sensing operation indirectly observes the retained charge in the floating gate by directly or indirectly observing the threshold voltage of the FGFET. By knowing the operational characteristics of the time cell and its initial programming condition, the observation can be converted into an elapsed time value. A time cell can be designed and/or programmed to select the range of time to be measured.